Ref. No. : Ex/ME(M2)/PE/B/T/325E/2023(S)

B.E. MECHANICAL ENGINEERING THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAM– 2023

ENERGY CONSERVATION AND MANAGEMENT

Time: 03 hours **Full Marks: 100**

Answer any five questions
Answers to all parts of a question must be together
Very brief and to-the-point answers will be given better credit
Use of steam tables and charts is allowed

1. a) What are commercial and non-commercial energy resources? Can there be an exchange between these two? Explain in very brief. 3+3
   b) Write two relative advantages and disadvantages between coal and natural gas as energy resources. 2+2
   c) What is energy intensity? Is it an indicator of the overall energy efficiency of a country, why? Can it be misleading also for comparing different countries for energy efficiencies, why? 2+2+2
   d) What is DSM? Why is it even better than improving energy efficiency? 2+2

2. a) What is sustainable development? Does energy conservation contribute to sustainable development? Explain in brief. 2+2
   b) Energy efficiency and energy conservation are identical? Explain in brief. 2
   c) What is electric grid? Does it contribute to energy conservation? Explain in brief. 2+2
   d) Discuss specific features of Indian power tariff. Does it have any specific issue regarding energy conservation? 3+2
   d) State five co-benefits of energy conservation? 5

3. a) Draw a neat schematic of a two-pressure CCGT. Show the energy transfer vs temperature diagram with pinch points. 6+4
   b) Three heat engines A, B and C are connected in series in a combined power cycle. If the efficiencies of these three engines are 0.5, 0.4 and 0.25 respectively, what is the overall efficiency of the combined cycle? 10

4. a) A back pressure cogeneration plant requires 10t/h of steam for process heating at 3bar saturated and 1000kW of power. If the isentropic efficiency of the turbine is 70%, find the steam condition at the inlet of the turbine. 12
   b) What are EUF and $(EUF)_{VW}$? Which one is better and why? 6+2

5. a) With a neat sketch, show the principle of operation of a heat pipe. Why is it an efficient device for gas to gas waste heat recovery? 6+2
   b) What are the different types of matrix used in a heat wheel? State one advantage and one disadvantage of each type. 4+8

6. Write short notes on: a) FESR, b) RoI, c) pinch point, d) energy auditor 4X5